US009065196B2

(12) **United States Patent**
Ohnuma et al.

(10) **Patent No.: US 9,065,196 B2**
(45) **Date of Patent: Jun. 23, 2015**

(54) **COMPRESSION METHOD FOR ELECTRIC WIRE AND ELECTRIC WIRE WITH TERMINAL OBTAINED THEREBY**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 8 days.

(21) Appl. No.: **14/174,278**

(22) Filed: **Feb. 6, 2014**

(65) **Prior Publication Data**

US 2014/0154915 A1 Jun. 5, 2014

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2012/070717, filed on Aug. 8, 2012.

(30) **Foreign Application Priority Data**

Aug. 8, 2011 (JP) 2011-173340

(51) **Int. Cl.**

H01R 4/20	(2006.01)
H01R 13/52	(2006.01)
H01R 4/18	(2006.01)
H01R 4/62	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 13/52*** (2013.01); ***H01R 4/184*** (2013.01); ***H01R 4/20*** (2013.01); ***H01R 4/62*** (2013.01)

(58) **Field of Classification Search**

CPC H01R 4/20; H01R 4/188; H01R 4/183; H01R 4/185

See application file for complete search history.

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(57) **ABSTRACT**

An electric wire with terminal is provided to include: an inner terminal including a crimp part that is crimped to compress a conductor part of a covered electric wire; an outer terminal that is compressed to the inner terminal by a front part thereof and is compressed to the covered electric wire by a rear part thereof; and a waterproof seal sleeve that is attached to a tip of the conductor part of the covered electric wire, wherein the seal sleeve is crimped by the crimp part of the inner terminal.

3 Claims, 7 Drawing Sheets

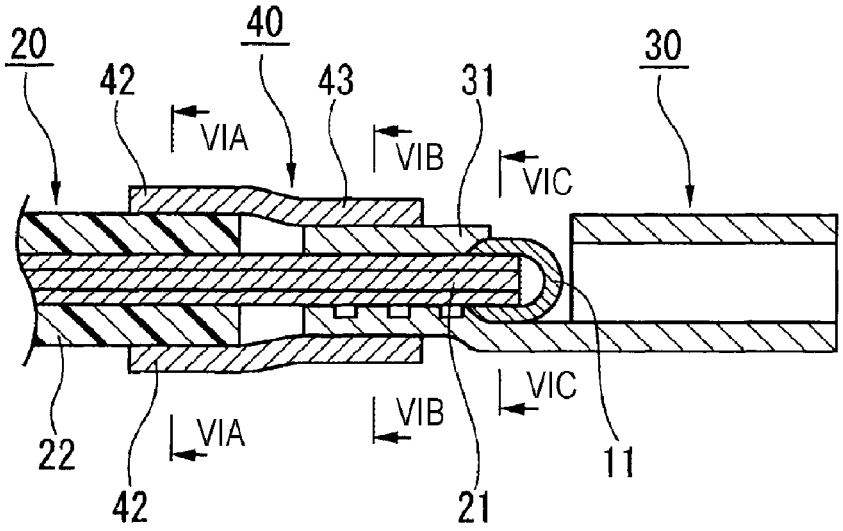

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FIG.1A

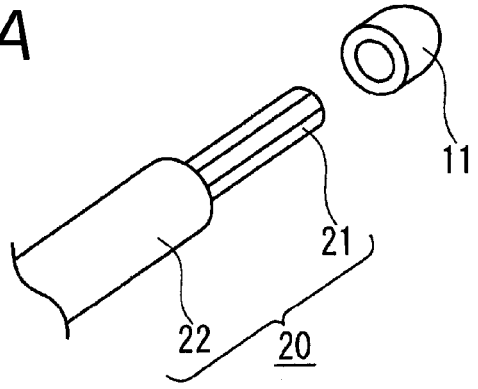


FIG.1B

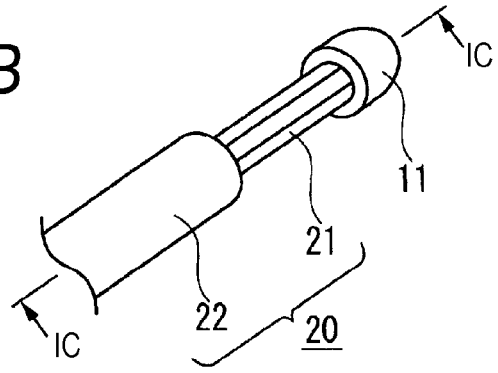


FIG.1C

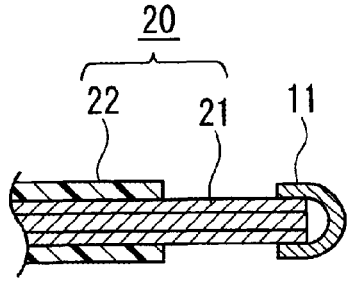


FIG.2A

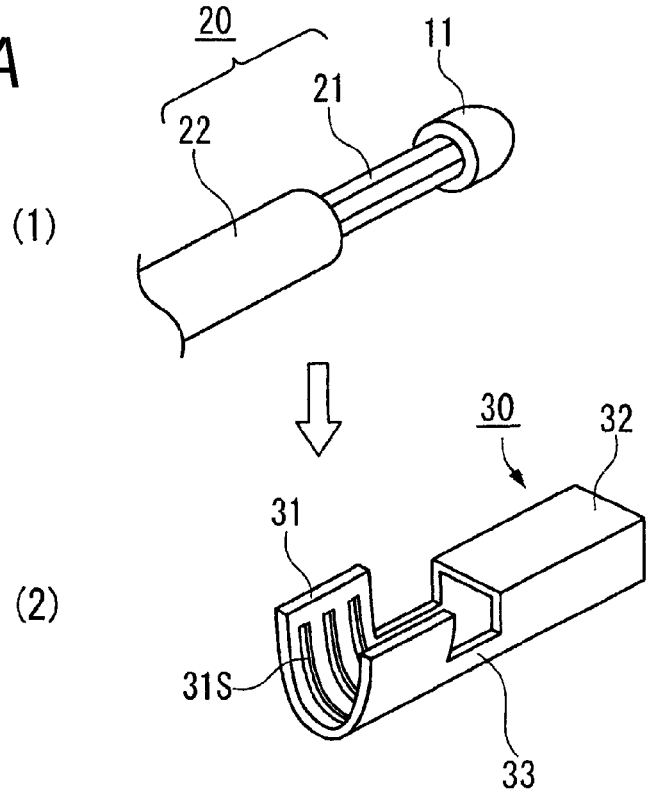


FIG.2B

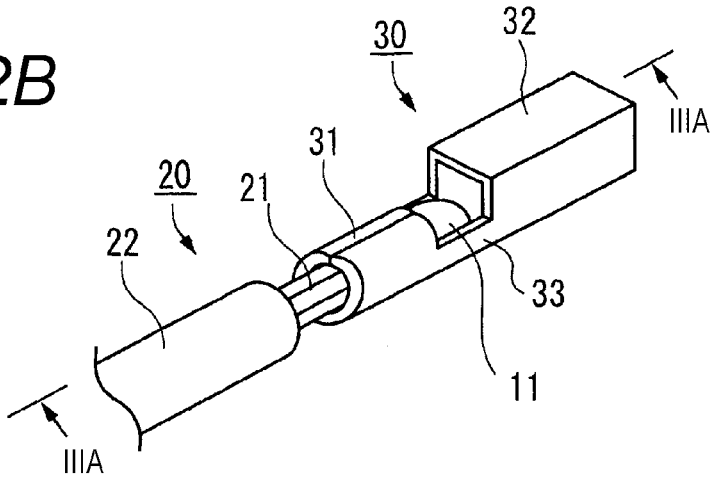


FIG.3A

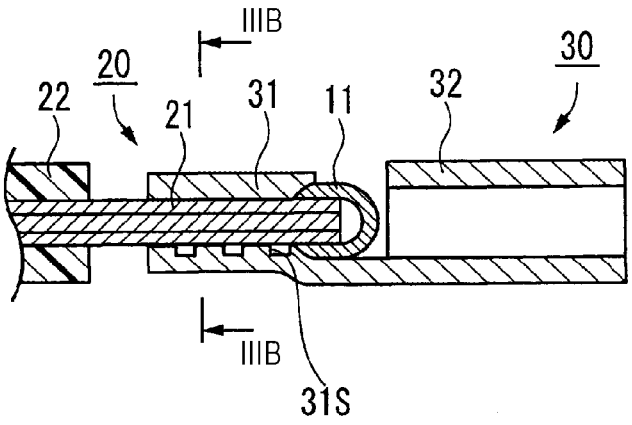


FIG.3B

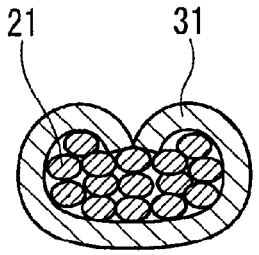


FIG.4A

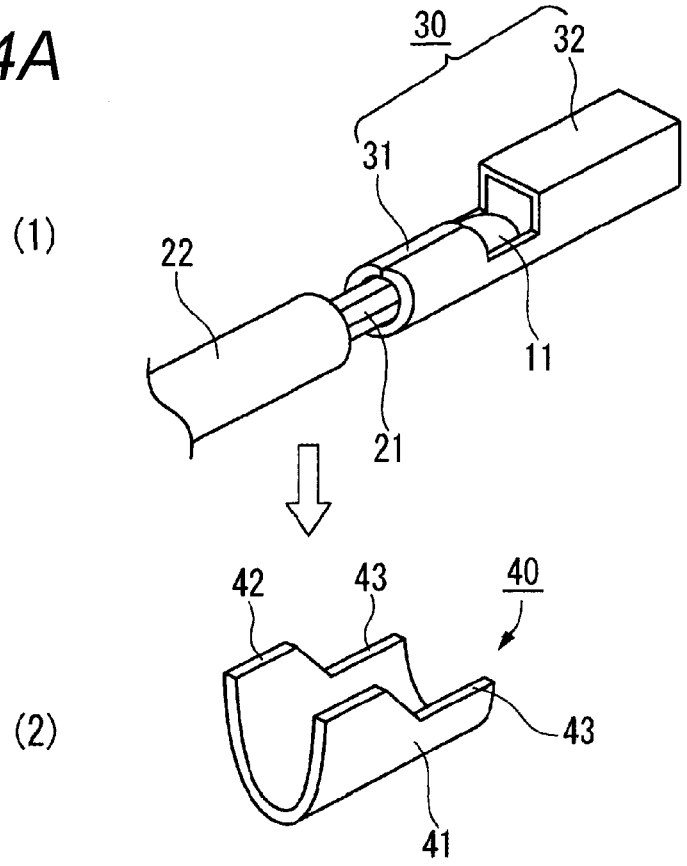


FIG.4B

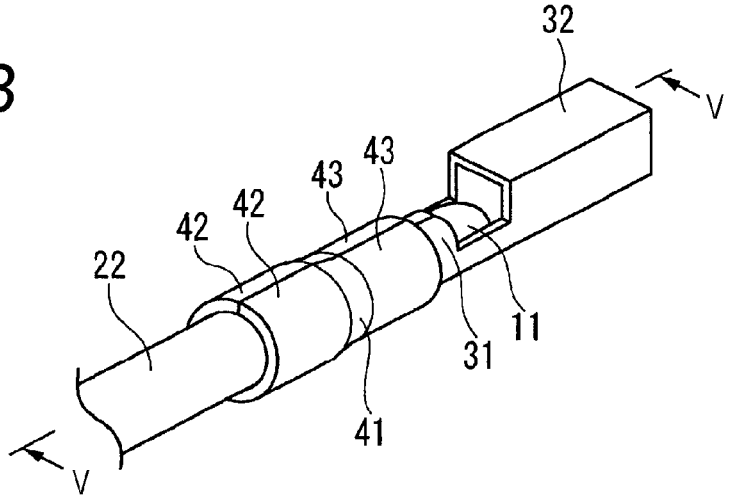


FIG.5

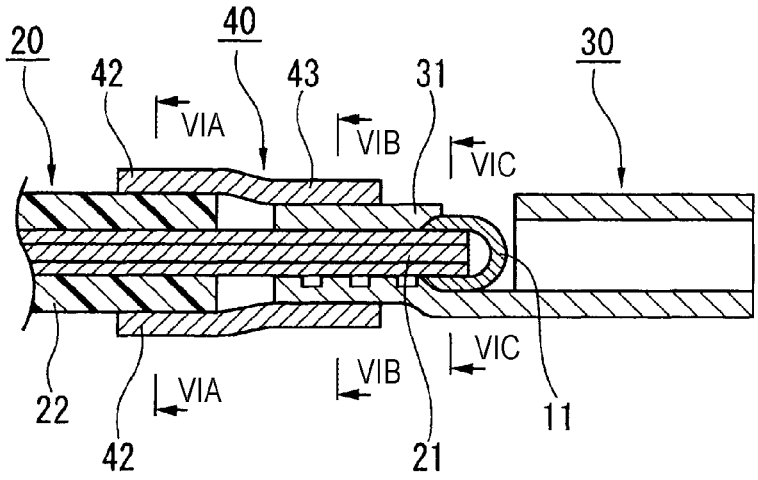


FIG. 6A

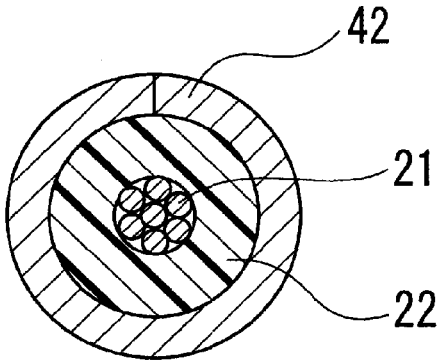


FIG. 6B

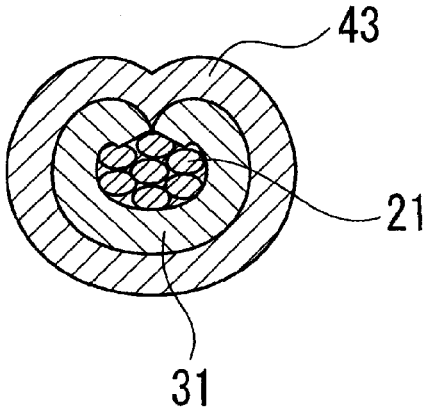


FIG. 6C

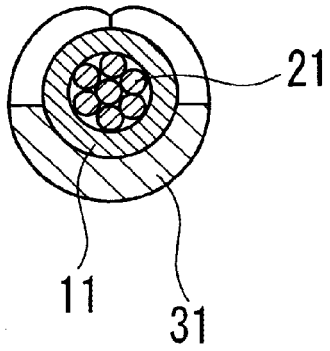


FIG.7A

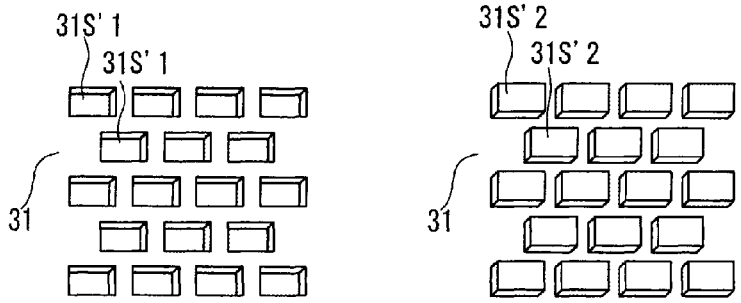


FIG.7B

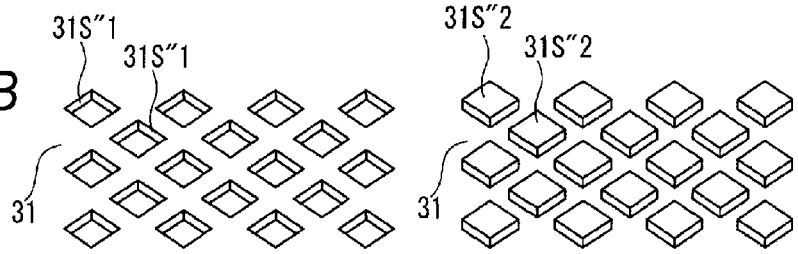
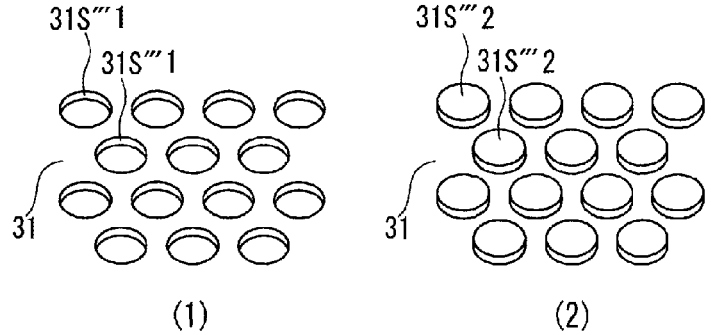


FIG.7C



COMPRESSION METHOD FOR ELECTRIC WIRE AND ELECTRIC WIRE WITH TERMINAL OBTAINED THEREBY

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of PCT application No. PCT/JP2012/070717, which was filed on Aug. 8, 2012 based on Japanese Patent Application (No. 2011-173340) filed on Aug. 8, 2011, the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electric wire compression method compressing a conductor part of an electric wire to a compression terminal, and an electric wire with a terminal obtained by the method.

2. Description of the Related Art

In the related art, as an example of the electric wire compression method of compressing a conductor part of the electric wire to the compression terminal, a method of placing a conductive member has been known (for example, see JP-A-2000-251961).

The compression terminal disclosed in JP-A-2000-251961 is constituted by an electrical contact section and a wire compression section, and the wire compression section is formed with a conductor compression section for compression the conductor part of the electric wire, and a cover compression section for compression a covering section of the electric wire. The conductor compression section is provided with a stripe-like conductive member. The conductive member contributes to embedding a gap between the conductor compression section and the conductor part generated during compression in a gas-tight state.

SUMMARY OF THE INVENTION

According to the art described in JP-A-2000-251961, a method of manufacturing the compression terminal with high compression reliability and easy process management is obtained. Since an aluminum electric wire is normally used as the electric wire and a copper terminal is used as the terminal, when water enters the compression section, it has been found that galvanic corrosion due to an electric potential difference between different metals is generated, and there is a concern that the electric resistance of the compression section may rise and mechanical fixing force may fall.

For this reason, there is a need for an electric wire with a terminal including a corrosion prevention technique.

In order to prevent the corrosion, (a) a technique of inserting a rubber cap into the electric wire or (b) a technique of applying resin to an end section of an electric wire is considered. However, since a rubber cap insertion tool is required for the insertion of the rubber cap and a resin application tool is required for the resin application, flexible production has been difficult.

The present invention has been made under the circumstances mentioned above, and an object thereof is to provide an electric wire compression method and an electric wire with a terminal in which galvanic corrosion due to the electric potential difference between the different metals is not generated even in an electric wire with the terminal using an aluminum electric wire and a copper terminal, and thus there is no concern that the electric resistance of the compression section may rise and the mechanical fixing force may fall.

In order to achieve the object, the present invention may provide any one of the following configurations 1 to 6.

1) A compression method for an electric wire for compressing a terminal to a conductor part exposed by removing a covering section of a covered electric wire to form an electrically connected electric wire with the terminal, the compression method including:

(1) a process of removing the covering section of the covered electric wire;

(2) a process of setting a tip of the conductor part, from which the covering section is removed in the process (1), in a crimp part of an inner terminal that includes an electric connection section that is connected to a mating terminal and the crimp part that is crimped to compress the conductor part, thereby compressing and connecting the inner terminal; and

(3) a process of setting the inner terminal compressed and connected in the process (2) in a front part of an outer terminal, setting the covering section of the covered electric wire in a rear part of the outer terminal, and compressing and connecting the front part and the rear part of the outer terminal, the outer terminal having the front part and the rear part in a longitudinal direction, wherein

the compression method further includes:

(a) a process of attaching a waterproof seal sleeve to the tip of the conductor part, from which the covering section is removed in the process (1), between the processes (1) and (2), and

(b) simultaneously setting the waterproof seal sleeve when setting the tip of the conductor part, and compressing and connecting the inner terminal, whereby

the waterproofing is performed between the covered electric wire and the outer terminal in the rear part of the outer terminal, and also the waterproofing is performed between the inner terminal and the outer terminal in the front part of the outer terminal.

2) The compression method according to the configuration 1), wherein the waterproof seal sleeve includes a seal sleeve having a cap shape formed of metal or resin.

3) The compression method according to the configuration 1), wherein the crimp part of the inner terminal is provided with a serration formed of a plurality of concavities and convexities.

4) An electric wire with terminal, including:

an inner terminal including a crimp part that is crimped to compress a conductor part of a covered electric wire;

an outer terminal that is compressed to the inner terminal by a front part thereof and is compressed to the covered electric wire by a rear part thereof; and

a waterproof seal sleeve that is attached to a tip of the conductor part of the covered electric wire, wherein the seal sleeve is crimped by the crimp part of the inner terminal.

5) The electric wire with terminal according to the configuration 4), wherein the waterproof seal sleeve includes a seal sleeve having a cap shape formed of metal or resin.

6) The electric wire with terminal according to the configuration 4), wherein the crimp part of the inner terminal is provided with a serration formed of a plurality of concavities and convexities.

According to the compression method of 1) mentioned above, since a waterproof seal sleeve is attached to a tip of a conductor part with a covering section removed therefrom, and the seal sleeve is compressed and connected by an inner terminal, a gap allowing water to enter is not formed between the conductor part tip and the inner terminal. Thus, since water does not enter, even in the electric wire with the termi-

nal using the aluminum electric wire and the copper terminal, galvanic corrosion due to the electric potential difference between the different metals is not generated. Accordingly, there is no concern that the electric resistance of the compression section may rise and the mechanical fixing strength may fall.

According to the compression method of 2) mentioned above, since the cap-like seal sleeve formed of metal or resin is used as the waterproof seal sleeve, the waterproof can be simple, and thus productivity is improved.

According to the electric wire compression method of 3) mentioned above, a serration formed of a plurality of concavities and convexities is provided in a crimp part of the inner terminal, and the serration is strongly compressed to the conductor part of the tip of the covered electric wire.
Thus, even when the conductive member as in JP-A-2000-251961 is not used, the relative movement cannot be performed.

According to the electric wire with terminal of 4) mentioned above, the seal sleeve made of metal or resin is attached to the tip of the conductor part, and the seal sleeve is crimped by the inner terminal. Thus, a gap allowing water to enter is not formed between the conductor part tip and the inner terminal. Accordingly since water does not enter, even in the aluminum electric wire and the electric wire with the terminal using the cooper terminal, galvanic corrosion due to the electric potential difference between the different metals is not generated. Thus, there is no concern that the electrical resistance of the compression section may rise and the mechanical fixing force may fall.

According to the electric wire with terminal of 5) mentioned above, since the cap-like seal sleeve formed of metal or resin is used as the waterproof seal sleeve, the waterproof can be simple, and thus productivity is improved.

According to the electric wire with terminal of 6) mentioned above, a serration formed of a plurality of concavities and convexities is provided in a crimp part of the inner terminal, and the serration is strongly compressed to the conductor part of the tip of the covered electric wire. Thus, even when the conductive member as in JP-A-2000-251961 is not used, the relative movement cannot be performed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a perspective view before an assembly of a covered electric wire and a seal sleeve used in an electric wire compression method according to an embodiment of the present invention.

FIG. **1**B is a perspective view after the assembly of the covered electric wire and the seal sleeve.

FIG. **1**C is a cross-sectional view taken along a line IC-IC in FIG. **1**B.

FIG. **2**A is a perspective view before compression a covered electric wire assembled with the seal sleeve to an inner terminal, in which: (1) is a perspective view of the covered electric wire assembled with the seal sleeve; and (2) is a perspective view of the inner terminal.

FIG. **2**B is a perspective view after compression the covered electric wire assembled with the seal sleeve to the inner terminal.

FIG. **3**A is a cross-sectional view taken along a line IIIA-IIIA in FIG. **2**B.

FIG. **3**B is a cross-sectional view taken along a line IIIB-IIIB in FIG. **3**A.

FIG. **4**A is a perspective view before compression the covered electric wire with the inner terminal compressed thereto to an outer terminal, in which: (1) is a perspective view of the covered electric wire with the inner terminal compressed thereto; and (2) is a perspective view of the outer terminal.

FIG. **4**B is a perspective view after compression the covered electric wire with the inner terminal compressed thereto to the outer terminal

FIG. **5** is a cross-sectional view taken along a line V-V in FIG. **4**B.

FIG. **6**A is a cross-sectional view taken along a line VIA-VIA in FIG. **5**.

FIG. **6**B is a cross-sectional view taken along a line VIB-VIB in FIG. **5**.

FIG. **6**C is a cross-sectional view taken along a line VIC-VIC in FIG. **5**.

FIG. **7**A is a plan view of rectangular concave serrations (**1**) and convex serrations (**2**), which are formed in the crimp part of the inner terminal.

FIG. **7**B is a plan view of diamond-shaped concave serrations (**1**) and convex serrations (**2**), which are formed in the crimp part of the inner terminal.

FIG. **7**C is a plan view of circular concave serrations (**1**) and convex serrations (**2**), which are formed in the crimp part of the inner terminal.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

An embodiment of the present invention, in which galvanic corrosion due to the electric potential difference between the different metals is not generated even in an aluminum electric wire and an electric wire with a terminal using a copper terminal, will be described below in detail based on the drawings.

FIG. **1**A is a perspective view before an assembly of a covered electric wire and a seal sleeve used in an electric wire compression method according to the embodiment of the present invention. FIG. **1**B is a perspective view after the assembly of the covered electric wire and the seal sleeve. FIG. **1**C is a cross-sectional view taken along a line IC-IC in FIG. **1**B. In FIG. **1**A, there are shown a seal sleeve **11**, a covered electric wire **20**, a conductor part **21**, and a covering section **22**.

<Seal Sleeve **11**>

The seal sleeve **11** has a cap shape made of metal or resin. The inner diameter of the seal sleeve **11** is preferably slightly greater than the diameter of the conductor part (a core wire) **21** of the covered electric wire **20** and is equal to or smaller than an outer diameter of the covering section **22**. The depth (a height) of an internal space of the seal sleeve **11** is longer than the length from a tip of the conductor part **21** to an end of a crimp part **31** of an inner terminal **30** (see FIG. **2**A(**2**)) in a state where the tip of the conductor part **21** of the covered electric wire **20** is crimped to the crimp part **31** (see FIG. **2**B).

<Covered Electric Wire **20**>

The covered electric wire **20** is configured so that the conductor part **21** is received in the covering section **22** and, for example, a multi-core aluminum wire is selected as the conductor part **21**.

<Assembling of Seal Sleeve **11** in Embodiment>

In FIG. **1**A, the covering section **22** of the covered electric wire **20** is removed as much as the tip portion of the conductor part **21** so that the conductor part **21** is exposed. When covering and assembling the tip of the conductor part **21** with the seal sleeve **11**, a state shown in FIG. **1**B is obtained.

FIG. **1**C is a cross-sectional view taken along the line IC-IC in FIG. **1**B. As understood from FIG. **1**C, the tip of the

conductor part **21** is assembled in a state of coming into contact with the inside of the seal sleeve **11**.

<Electric Wire with Inner Terminal>

When the covered electric wire **20**, in which the seal sleeve **11** is assembled to the tip of the conductor part **21** as shown in FIG. **2**A(**1**), is compressed to the inner terminal **30** shown in FIG. **2**A(**2**), an electric wire with an inner terminal as shown in FIG. **2**B is obtained.

In FIG. **2**A(**2**), the inner terminal **30** is configured so that a rear end thereof is formed with a crimp part **31** for crimping the conductor part **21** of the covered electric wire **20** by bending a conductive metal, a tip thereof is formed with an electric connections section **32** connected to an mating terminal, and the crimp part **3** and the electric connection section **32** are connected by an interconnecting section **33** having a short length and a U-shaped cross-section.

<Crimp Part **31**>

The crimp part **31** is formed in a U shape when viewed in a longitudinal cross-section, and a serration **31**S constituted by concavities and convexities is formed inside the crimp part **31**. The serration **31**S in FIG. **2**A is realized by a plurality of concave and convex grooves which are extended in a direction of vertically crossing an axis and are parallel to each other. That is, by forming the concave grooves with respect to the surface of the crimp part **31** so as to be parallel to each other, the surface of the crimp part **31** between two concave grooves adjacent to each other becomes a convex section, and a plurality of concave and convex grooves parallel to each other is realized. By forming such a serration **31**S, the conductor part **21** and the crimp part **31** cannot be moved relative to each other.

Furthermore, conversely, by forming the convex section with respect to the surface of the crimp part **31** so as to be parallel to each other, the surface of the crimp part **32** between the two convex sections adjacent to each other becomes the concave surface, and it is also possible to realize a plurality of concave and convex grooves parallel to each other.

In addition, although the serration **31**S is realized by a plurality of linear concavities and convexities herein, as will be described in FIGS. **7**A to **7**C, it is also possible to realize the serration by rectangular concavities and convexities, diamond-shaped concavities and convexities, or circular concavities and convexities.

<Electric Connection Section **32**>

The electric connection section **32** is formed in a male type or a female type, and is electrically connected to a mating terminal of the female type or the male type. In FIG. **2**A, the electrical connection section **32** is a hollow and elongated square pole and is the female type, and the corresponding male terminal is inserted to the internal cavity.

<Interconnecting Section **33**>

The interconnecting section **33** is a part that connects between the crimp part **31** forming a U-shaped cross-section and the electric connection section **32** having a square-shaped cross-section, and forms a U shape shorter than the U shape of the crimp part **31**. The tip section of the seal sleeve **11** adopted in the embodiment is received in the interconnecting section **33**. In addition, the rear end section of the seal sleeve **11** is received in the front end of the crimp part **31** and is crimped by the crimp part **31**.

As described above, when accommodating and compression the covered electric wire **20** (FIG. **2**A(**1**)) assembled with the seal sleeve **11** to the inner terminal **30** shown in FIG. **2**A(**2**) so that the tip of the seal sleeve **11** is caught in the U-shaped groove of the interconnecting section **33** of the inner terminal **30** and the rear end of the seal sleeve **11** is caught in an edge section of the crimp part **31** of the inner terminal **30**, an electric wire with the inner terminal as shown in FIG. **2**B is obtained. As understood from the cross-sectional view of FIG. **3**A, since the rear end of the seal sleeve **11** is compressed by the edge section of the crimp part **31** of the inner terminal **30**, water does not enter the electric wire with the inner terminal from the tip of the conductor part **21** of the covered electric wire **20**.

FIG. **3**A is a cross-sectional view taken along the line IIIA-IIIA in FIG. **2**B, and FIG. **3**B is a cross-sectional view taken along the line IIIB-IIIB in FIG. **3**A. In FIG. **3**A, the seal sleeve **11** covers the tip of the conductor part **21** in which the covering section **22** of the covered electric wire **20** is removed, and the rear end of the seal sleeve **11** is compressed by the edge section of the crimp part **31** of the inner terminal **30**, whereby water is prevented from entering from the tip of the conductor part **21** of the covered electric wire **20**. Furthermore, in FIG. **3**B, the conductor part **21**, in which the covering section **22** of the covered electric wire **20** is removed, is crimped (or compressed) by the crimp part **31** of the inner terminal **30**. Thus, the conductor part **21** cannot move relatively in a longitudinal direction by the serration **31**S formed in the crimp part **31**.

<Electric Wire with Outer Terminal and Inner Terminal>

FIGS. **4**A and **4**B are diagrams that describe an aspect of compressing the covered electric wire, to which the inner terminal is compressed, to the outer terminal. Specifically, FIG. **4**A is a perspective view before the compression, and FIG. **4**B is a perspective view after the compression. Furthermore, in FIG. **4**A, (**1**) is a perspective view of the covered electric wire to which the inner terminal is compressed, and (**2**) is a perspective view of the outer terminal. As shown in FIG. **4**A(**1**), when the covered electric wire **20**, in which the conductor part **21** is crimped by the crimp part **31** of the inner terminal **30**, is compressed to the outer terminal **40** shown in FIG. **4**A(**2**), an electric wire with the outer terminal and the inner terminal shown in FIG. **4**B is obtained.

In FIG. **4**A(**2**), the outer terminal **40** is formed by bending the conductive metal in a U shape. At a deployment barrel before being bent in the U shape, the length differs between a rear part **42** and a front part **43** in an axial direction, the deployment barrel length of the rear part **42** is longer than the deployment barrel length of the front part **43**, and a difference in the deployment barrel length between the rear part **42** and the front part **43** is complemented by the slope of the edge section of the interconnecting section **41**.

Thus, the covered electric wire **20** with the inner terminal **30** in FIG. **4**A(**1**) is set to the outer terminal **40** shown in FIG. **4**A(**2**). At that time, when accommodating, crimping and compression an axial central section of the crimp part **31** of the inner terminal **30** to the U-shaped groove of the front part **43** of the outer terminal **40**, and the tip of the covering section **22** of the covered electric wire **20** to the U-shaped groove of the rear part **42** of the outer terminal **30**, respectively, the electric wire with the outer terminal and the inner terminal as shown in FIG. **4**B is obtained. As understood from the cross-sectional view of FIG. **5**, in such an electric wire with the terminal, since the front part **43** of the outer terminal **40** is compressed to the inner terminal **30** and the rear part **42** of the outer terminal **40** is compressed to the covering section **22** of the covered electric wire **20**, water does not enter the conductor part **21** of the covered electric wire **20**.

FIG. **5** is a cross-sectional view taken along the line V-V in FIG. **4**B. In FIG. **5**, the tip of the conductor part **21**, in which the covering section **22** of the covered electric wire **20** is removed, is covered by the seal sleeve **11**, and the rear end of the seal sleeve **11** is compressed by the edge section of the

crimp part **31** of the inner terminal **30**. Thus, water is prevented from entering from the tip of the conductor part **21**.

Furthermore, the front part **43** of the outer terminal **40** is compressed to the crimp part **31** of the inner terminal **30** and the rear part **42** of the outer terminal **40** is compressed to the covering section **22** of the covered electric wire **20**. Thus, water is prevented from entering the conductor part **21** from both ends of the outer terminal **40**.

<Gap is Not Present in Any Cross-Section>

FIG. **6**A is a cross-sectional view taken along the line VIA-VIA in FIG. **5**, FIG. **6**B is a cross-sectional view taken along the line VIB-VIB in FIG. **5**, and FIG. **6**C is a cross-sectional view taken along the line VIC-VIC in FIG. **5**.

(a) In FIG. **6**A, the rear part **42** of the outer terminal **40** is compressed to the covering section **22** of the covered electric wire **20**, and a gap is not present between the rear part **42** of the outer terminal **40** and the covering section **22** of the covered electric wire **20**. Thus, water does not enter therefrom.

(b) In FIG. **6**B, the front part **43** of the outer terminal **40** is compressed to the crimp part **31** of the inner terminal **30**, and a gap is not present between the front part **43** of the outer terminal **40** and the crimp part **31** of the inner terminal **30**. Thus, water does not enter therefrom.

(c) In FIG. **6**C, since the tip of the crimp part **31** of the inner terminal **30** is compressed to the rear end of the seal sleeve **11**, a gap is not present between the crimp part **31** and the seal sleeve **11**. Thus, water does not enter therefrom.

In this manner, according to the embodiment of the present invention, water does not enter from any location of the covered electric wire **20** in the longitudinal direction. Accordingly, even in the electric wire with the terminal using the aluminum electric wire and the copper terminal, there is no galvanic corrosion due to the electric potential difference between the different metals, and thus there is no concern that the electric resistance of the compression section may rise and the mechanical fixing force may fall.

<Modified Example of Serration **31**S>

FIGS. **7**A to **7**C are plan views that show other suitable serrations with which the serration **31**S using the long grooves formed in the crimp part **31** of the inner terminal **30** (FIG. **2**A(**2**)) is replaced. FIG. **7**A is a rectangular serration **31**S', FIG. **7**B is a diamond-shape serration **31**S", and FIG. **7**C is a circular serration **31**S'". Furthermore, each drawing includes (**1**) and (**2**), (**1**) is the serration using the concave section, and (**2**) is the serration using the convex section.

<Rectangular-Shaped Serration **31**S'>

In FIG. **7**A, a rectangular shape **31**S' of the first row and the odd numbered rows (S'**1** of the concave section and S'**2** of the convex section) and a rectangular shape **31**S' of the second row and the even numbered rows are placed in a zigzag manner so as to be shifted each other in a parallel direction, and form a check pattern as a whole. In this manner, since the concave and convex serrations of the check pattern are strongly compressed to the conductor part **21** of the tip of the covered electric wire **20**, as in the case of the linear serration **31**S, the conductor part **21** cannot be relatively moved.

<Diamond-Shaped Serration **31**S">

In FIG. **7**B, a diamond shape **31**S" of the first row and the odd numbered rows (S"**1** of the concave section and S"**2** of the convex section) and a diamond shape **31**S" of the second row and the even numbered rows are placed in a zigzag manner so as to be shifted relative to each other in a parallel direction, and form a check pattern as a whole. In this manner, since the concave and convex serrations of the check pattern are strongly compressed to the conductor part **21** of the tip of the covered electric wire **20**, as in the case of the linear serration **31**S, the conductor part **21** cannot be relatively moved.

<Circular-Shaped Serration **31**S'">

In FIG. **7**C, a circular shape **31**S'" of the first row and the odd numbered rows (S'"**1** of the concave section and S'"**2** of the convex section) and a circular shape **31**S'" of the second row and the even numbered rows are placed in a zigzag manner so as to be shifted each other in a parallel direction, and form a check pattern as a whole. In this manner, since the concave and convex serrations of the check pattern are strongly compressed to the conductor part **21** of the tip of the covered electric wire **20**, as in the case of the linear serration **31**S, the conductor part **21** cannot be relatively moved.

<Conclusion>

With the electric wire compression method according to the embodiment of the present invention, since the waterproof seal sleeve is attached to the conductor part tip from which the covering section is removed, and the seal sleeve is compressed and connected by the inner terminal, a gap allowing water to enter is not formed between the conductor part tip and the inner terminal. Thus, since water does not enter, even in the aluminum electric wire and the electric wire with the copper terminal, galvanic corrosion due to the electric potential difference between the different metals is not generated. Accordingly, there is no concern that the electric resistance of the compression section may rise and the mechanical fixing force may fall.

Furthermore, since the cap-shaped seal sleeve formed of metal or resin is used as the waterproof seal sleeve, the waterproof can be simplified, and thus productivity is improved.

Additionally, since the serration is strongly compressed to the conductor part of the tip of the covered electric wire, by forming the serration including the plurality of concavities and convexities in the crimp part of the inner terminal by linear-shaped concavities and convexities, rectangular-shaped or diamond-shaped concavities and convexities, or circular-shaped concavities and convexities, the relative movement can be prevented and waterproofing is easy.

The present invention is useful when an electric wire with terminal is placed at a location where water, which can generate galvanic corrosion, may exist since water hardly enters the area of the conductor part of the electric wire due to the seal sleeve provided at the tip of the covered electric wire.

What is claimed is:

1. An electric wire with terminal, comprising:

an inner terminal including a crimp part that is crimped to compress a conductor part of a covered electric wire;

an outer terminal that is compressed to the inner terminal by a front part thereof and is compressed to the covered electric wire by a rear part thereof; and

a waterproof seal sleeve that is attached to a tip of the conductor part of the covered electric wire, wherein the seal sleeve is crimped by the crimp part of the inner terminal.

2. The electric wire with terminal according to claim **1**, wherein

the waterproof seal sleeve includes a seal sleeve having a cap shape formed of metal or resin.

3. The electric wire with terminal according to claim **1**, wherein

the crimp part of the inner terminal is provided with a serration formed of a plurality of concavities and convexities.

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